

AMENDMENTS TO THE CLAIMS

A complete listing of the claims is provided hereinafter.

Please amend the claims as follows:

1. (Currently Amended) A method of analyzing data obtained from well logs taken in a subsurface geological formation having thinly interbedded sandstone and shale layers to determine an expected value of the hydrocarbon pore volume of the formation, comprising:

(a) defining an initial model of the subsurface formation based upon estimates of different bed types and bed-type parameters in the formation, one of said bed-type parameters being aspect ratio, the initial model including a system of log equations for predicting well logs from bed-type parameters;

(b) performing a Monte Carlo inversion to find the ranges of bed-type parameters consistent with the measured well log data, wherein performing the Monte Carlo inversion comprises computing distribution statistics for interval hydrocarbon pore volume; and

(c) determining generating a statistical distribution for hydrocarbon pore volume representing the expected value for for, and an uncertainty in in, the hydrocarbon pore volume from said computing distribution statistics from said Monte Carlo inversion.

2. (Original) The method of claim 1 wherein at least one of said bed types has a finite lateral extent and a positive aspect ratio.

3. (Original) The method of claim 1 wherein the step of defining the initial subsurface formation model comprises:

(a) selecting an analysis interval;
(b) obtaining average values of the measured well log data over the analysis interval;

- (c) formulating a set of reservoir and non-reservoir bed types constituting the selected analysis interval;
- (d) determining average values of the petrophysical parameters for each bed type;
- (e) assigning relative frequency of occurrence of the different bed types in the formation;
- (f) computing log responses for each bed type and over the composite analysis interval;
- (g) comparing the computed log responses to the measured log data for consistency; and
- (h) repeating steps (b) to (g) until the model parameters are consistent with the measured log data.

4. (Original) The method of claim 1 wherein the step of performing the Monte Carlo inversion comprises:

- (a) estimating uncertainty ranges for each bed-type parameter and for bed frequencies;
- (b) generating a random model consisting of random variants for each bed-type parameter and frequency;
- (c) computing estimates of average log responses over an analysis interval of the model;
- (d) comparing estimated log responses to measured log responses for consistency;
- (e) retaining the model only if estimated log responses are consistent with measured log responses;
- (f) repeating steps (a) to (e) until a specified number of trials has been completed; and

(g) computing distribution statistics for interval hydrocarbon pore volume and related parameters.

5. (Original) The method of claim 1 wherein the step of performing the Monte Carlo inversion includes estimating uncertainties for the formation bed properties and for the volume fractions.

6. (Original) The method claim 1 wherein the step of performing a Monte Carlo inversion is carried out using a programmed digital computer.

7. (Original) The method of claim 1 wherein the formation model has inputs which comprise a set of parameters describing the thinly bedded formation and has outputs which are the formation average porosity, average water saturation, sand fraction, and average hydrocarbon pore volume.

8. (Original) The method of claim 7 wherein the accuracy of the input parameters of the formation model are described in terms of probability distributions of parameter values and wherein the step of performing a Monte Carlo inversion involves making a plurality of cases wherein each case comprises a random selection of a parameter value for each input parameter from the probability distribution and calculating a set of outputs.

9. (Original) The method of claim 8 wherein the step of performing a Monte Carlo inversion is made using a spreadsheet programmed in a digital computer and wherein each case involves a recalculation of the spreadsheet to obtain a resultant set of outputs.

10. (Original) The method of claim 9 wherein the step of performing a Monte Carlo inversion involves making at least one thousand cases and each resultant set of outputs comprises calculated log responses.

11. (Original) The method of claim 10 wherein the resultant set of outputs from each case is retained only if that case produces a set of calculated log response outputs which correspond to the input log values within a specified closeness of fit.

12. (Original) The method of claim 11 further comprising the step of storing the retained sets of outputs and analyzing them for a determination of uncertainty in the estimate of hydrocarbon pore volume.

13. (New) The method of claim 1, wherein the statistical distribution comprises a histogram representing the expected value for, and an uncertainty in, the hydrocarbon pore volume.

14. (New) The method of claim 13, wherein the histogram represents a distribution of feasible solutions and a priori distributions for the hydrocarbon pore volume.

15. (New) The method of claim 14, wherein generating the statistical distribution comprises presenting probability values for hydrocarbon pore volume and at least one additional volumetric result.

16. (New) The method of claim 4, wherein the statistical distribution comprises a histogram representing the expected value for, and an uncertainty in, the hydrocarbon pore volume.

17. (New) The method of claim 16, wherein the histogram represents a distribution of feasible solutions and a priori distributions for the hydrocarbon pore volume.

18. (New) The method of claim 17, wherein generating the statistical distribution comprises presenting probability values for hydrocarbon pore volume and at least one additional volumetric result.